NEW THERMAL EMISSION MAPS OF THE MOON. D. S. McDougall[1], B. T. Greenhagen[2], K.A. Shirley[1], and T.D. Glotch[1] [1]Department of Geosciences, Stony Brook University, Stony Brook, NY 11794-2100, dylan.mcdougall@stonybrook.edu, [2]Johns Hopkins University, Applied Physics Lab, Laurel, MD.

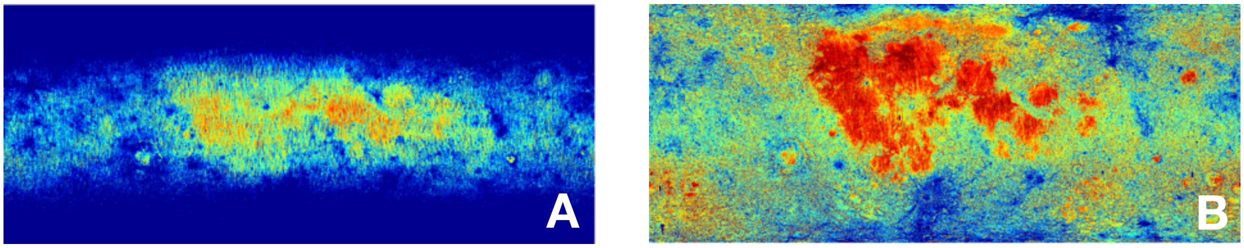

Figure 1A-B: Global maps of the Moon using uncorrected (A) and corrected (B) Diviner channel 6 emissivity stretched from 0.97-1.00. Latitude is between 70N and 70 S.

Introduction: Using thermal infrared datasets from LRO Diviner that describe lunar surface properties like roughness, porosity, or rock abundance requires making assumptions about the intrinsic emissivity of lunar surface materials. For this reason, we have generated a thermal emission dataset for two long wavelength Diviner channels with bandpasses of 13-23 and 25-41 μm.

In addition to their intended purpose of measuring surface temperature, these broadband channels also observe spectral differences that are diagnostic of mineralogy and chemical composition. However, illumination conditions introduce non-compositional effects to the data. Measurements with low sun angles have significantly lower radiance values than the same materials with noontime illumination at the equator. The long wavelength data must be normalized to equatorial noontime values for it to be comparable to laboratory spectra used in compositional studies.

Method: The relationship between radiance values and incidence angle is empirically modeled by fitting a cosine function. The uncorrected data is then additively shifted according to the cosine fit so that the mean radiance values match those for noontime data. The data is then normalized across incidence angle by a linear function to compensate for local roughness.

To apply the correction globally, longitudinal strips selected from representative highlands and mare areas are used to derive coefficients for the functions described above. These coefficients are themselves fit linearly according to latitude, and the latitude-dependent coefficients are used with the original functions to correct the gridded data used for mapping.

Results: High incidence angle, low radiance measurements dominate the uncorrected thermal emission data, especially at latitudes >20° from the equator (Fig. 1A). The high contrast in Fig. 1B demonstrates that the correction has successfully mitigated the effect of high incidence angle measurements for both equatorial and poleward data. A dataset of low incidence angle equatorial noon data was used to confirm that these global maps accurately depict the emissivity trends observed in the laboratory for simulated lunar materials.

Conclusion: This dataset will enhance several analyses that were previously impeded by inaccurate emissivity values for the long wavelength channels. The newly corrected data can be used standalone, with band ratios and indices incorporating the other Diviner channels and with calculations using other data products. These methods will help identify non- or extreme silicate mineralogies, develop a correction for the effects of space weathering, and constrain thermophysical properties of surfaces independently of albedo. After incorporating the latest data and validating the correction for each band, finalized global imagery will be included in a future LRO Diviner data product.

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